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AUTHOR Carl, Iris M.
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ABSTRACT

Data on the shortage of qualified teachers of mathematics and science are first reported in this speech to the National School Boards Association, with information from a number of sources cited. Then the innovative recruitment and incentive plan of the Houston Independent School District to attract and hold qualified teachers is detailed. (1) Interviews were conducted on college campuses, at professional meetings, and in urban centers in 42 states and Puerto Rico. (2) Teachers' personnel files were reviewed to identify teachers within the system not teaching mathematics or science, but with credits in those subjects. As a result of Project Search, 50 teachers were selected from over 300 possibilities for retraining as mathematics and science teachers. (3) A differential salary structure, the Houston Second Mile Plan, is in place, with mathematics and science teachers who quality receiving $2000 as an annual stipend. For all teachers, the starting salary has been raised, and the salary schedule compressed from 15 steps to 10 steps. Incentive pay is also given for high priority location, professional growth, outstanding teacher attendance, outstanding educational progress, and unique campus assignment, in addition to the critical staff shortage category. (MNS)

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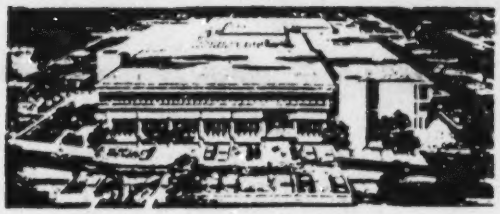

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CLINIC E-81

FINDING -- AND KEEPING -- GOOD MATH AND SCIENCE TEACHERS

Iris Carl, Instructional Supervisor, Houston Independent School District

The shortage of teachers in the critical fields of mathematics and science is a crisis of quality. Nationwide 50% of the mathematics and science teachers are thought to be unqualified. In 1982, of the 45 states responding to a National Council of Teachers of Mathematics survey, 43 states reported a critical or near crisis situation. The National Science Foundation reports that 16% of our elementary school teachers are not prepared to teach their students basic mathematics and science. The National Council of Supervisors of Mathematics reports that 60% of its membership finds it increasingly difficult to obtain qualified teachers. The New Jersey State Department declared an emergency shortage and permitted 17 of its 21 counties to hire unlicensed teachers. In urban districts the ratio of qualified applicants to open positions in mathematics is 1:10.

The concern of the National School Boards Association for providing qualified mathematics and science teachers and improving mathematics and science teaching in the public schools is shared by educators nationwide. The National Council of Teachers of Mathematics (NCTM) and the Houston Independent School District (HISD) welcome this opportunity to report

G-Graphics

current data, share an exemplar model, and make recommendations for action.

The supply of competent mathematics and science teachers is low and declining. In the past ten years there has been a 77% decline in the number of mathematics teachers and a 64% decline in the number of
G-1 science teachers in the nation. The teacher training institutions that traditionally produced sufficient numbers of classroom teachers to provide a steady supply of quality instruction are themselves lacking in eligible candidates. In California of the more than 400,000 students in the 4-year institutions in 1982 only 92 were mathematics education majors. Enrollments in other states listed the following degree candidates: Texas - 20, Iowa - 60, Missouri - 80, New York - 21, and Maryland - 17. An even more dismal interpretation of these facts is the high proportion of graduates who did not enter the teaching profession. In Texas only 7 out of 20 accepted teaching positions. In Missouri 40 of the 80 mathematics majors became teachers, while in Maryland just 8 of the 17 joined the ranks of educators. At a recent NCTM conference I was informed by a college educator that of 48,000 students at Penn State, only 3 are mathematics education majors. In 1983 only 4.7% of the entering freshmen aspire to careers in teaching. Science educators anticipate no reversal in the decline in the near future.

School districts are presently in fierce competition with one another to attract and hold qualified teachers. There is sufficient variation among the 50 states with regard to supply and demand to make innovative recruitment productive. Although there are no actual surpluses to report, the weighted distribution of teachers warrants atten-

tion. Recent legislative cutbacks and shifting populations create a notable source of experienced teachers who are qualified to teach mathematics or science. There are also some qualified future applicants in the universities (outside the colleges of education) in these critical fields who too should be made a primary target of recruitment drives.

G-2 In addition to its regular recruitment efforts, the Houston School District has been successful in a unique nationwide recruitment campaign. To implement this plan their personnel officers held 1,669 interviews mainly on college campuses, at professional meetings, and in urban centers in 42 states and Puerto Rico. Of the 978 teachers hired from this group who were assigned to the critical areas, instructional supervisors and principals agree that their qualifications and performance were outstanding. Twenty school districts are involved in a consortium - Math-Science Technology Education Project - at the University of Massachusetts at Amherst. Their plan is to implement strategies for a national recruitment of students in the critical fields who are not in the colleges of education. The National Council of Teachers of Mathematics recommends an in-house recruitment plan as a first step for every school district. It begins with a review of teachers' personnel files to identify teachers with credits in mathematics and science who are not assigned to teach in these subject areas. FINDING teachers...such a review was undertaken in Houston. Project Search, as it is called, is a teacher education program. Last spring over 300 teachers attended an orientation meeting from which 50 teachers were selected for retraining as mathematics and science teachers. HISD paid for college tuition and books. A $250 stipend was paid for each course completed in which an A or B grade -- a contingency -- was earned.

These teachers are now in their new assignments in middle schools providing challenging and exciting instruction. Variations of this plan are in evidence throughout the school districts of the nation and serve as an effective stop-gap measure.

School districts are also in fierce competition with the private sector. Economic trends have made employment outside the teaching profession extremely attractive for teachers and college graduates with backgrounds in mathematics and science. The number of mathematics and science majors that never enter the teaching profession is growing steadily. The National Science Foundation indicated that 25% of the 160,000 secondary mathematics teachers who were in our classrooms in 1981 planned to leave their positions. Genteel poverty is not the accepted way of life for teachers of this generation. The school marm is no longer with us. Women now have a host of options. Meeting today's costs for: food, housing, clothing, transportation, and recreation on an average salary of $20,000 places limits on teacher's aspirations for themselves and their families. The preparation and dedication we as a society expect, cannot be obtained and maintained to the degree required at the salaries we are willing to pay. The teachers leaving our schools or refusing to enter them are not making a monetary gain of $500 or even $5,000. They more often, because of their attractiveness gain $8,000 or $10,000 in buying power.

While some teacher organizations argue the well publicized fact that all teachers are grossly underpaid and that all should receive a dramatic salary increase, not a select few, others argue that the law of supply and demand should prevail and that teachers in the critical

areas should receive incentive and differential pay. The National Council of Teachers of Mathematics speaks in support of differential pay as it testifies before congressional hearings and when called upon to address this issue on national, state, and local levels. Secretary of Education, Terrell Bell, has called on the state and local schools to upgrade the profession by moving "...beyond the single salary schedule..." The legislatures of New Hampshire, Maryland, Massachusetts, and Tennessee are considering differential pay schedules to attract qualified mathematics and science teachers. In Oklahoma City, Oklahoma, in the school system, new mathematics and science teachers receive a $500 bonus and annually all certified mathematics and science teachers are eligible for $100 per course taught. In the Richmond, Virginia school district, certified teachers of mathematics and science, new to the district, receive a $2,000 bonus for signing. It is paid, $1,500 for the first year and $500 for the second year. When this plan was initiated, 300 applications were received where one application had been their prior experience.

The first and most comprehensive differential salary structure is the Houston Second Mile Plan. The plan was developed at the direction of Dr. Billy R. Reagan, general superintendent, with the approval of
G-3 the HISD Board of Education and implemented in 1979. One aspect of the plan addresses the critical shortage. Under this plan mathematics and science teachers who qualify receive $2,000 as an annual stipend. Teacher organizations that oppose the practice of paying mathematics and science teachers more money than other teachers contend that this serves to divide the teaching profession; that it identifies a subject area as being more important or a group of teachers smarter. The

National Council of Teachers of Mathematics in its endorsement of differential salaries in fields of short supply cite this plan as a valuable stop-gap measure. The president of NCTM, Stephen S. Willoughby, in his testimony before the United States Senate Committee on Labor and Human Resources states that, "The differentials ought not to be taken to mean that the teacher of one subject works harder, or is more important than another, but seen simply as a reflection of supply and demand." "The better solution," he continues, "is to pay an appropriate wage to every teacher." Differential pay is a short range approach that often serves to redistribute the teachers who are now available.

Salaries that are competitive with those in the private sector offered to applicants with comparable academic preparation are necessary to attract and keep mathematics and science teachers of high grade. Education Commission of the States reports that a series of comprehensive surveys reflecting the view of over 1000 state political and educational leaders, showed that fiscal problems constitute a primary concern, but of the component parts -- teachers' salaries was of lesser concern. Salaries constitute the largest part of every school districts' operating budget and it is salaries that are a substantial portion of the solution to the problem: FINDING -- AND KEEPING -- GOOD MATHEMATICS AND SCIENCE TEACHERS.

To give teachers' salaries top priority in the operating budget
G-4 HISD has raised the starting pay for 1982-83 for first year teachers to $16,000 - 14.2% increase over last year. A compressed salary schedule from 15 steps to 10 steps has been constructed to make this commitment to teaching as a profession real. Dr. Reagan explains that a qualified experienced teacher who collects all possible stipends under the Second

Mile Plan could earn $30,000. The potential earning will rise to $40,000 -- double the present national average -- within three years. The Southern Regional Education Board in a summary of the work of its task force reported that several southern states are presently setting goals for higher teacher salaries. Some states are trying to raise salaries just enough to match the levels of those in neighboring states. Florida is trying to become one of the top 25% nationwide, while Virginia and many others have reaching the national average as their goal.

Salary schedules of the school systems of the nation, low at best, and tied to years of service and amounts of higher education are not the sole cause for this dramatic decline. Therefore salaries alone will not keep qualified teachers before our students in our mathematics and science
G-5 classrooms. Burnout and stress have been described as contributory factors. Broad sweeping changes have assigned to our schools social and familial roles. The varied profiles of urban students have made our classrooms an ever-changing mosaic of cultural and ethnic diversities. The high mobility of our school populations has caused a constant shifting of teaching assignments. Time needed for preparation, evaluation, and administration of instruction have made incursions into the personal time of teachers.

Patricia Shell, superintendent for instruction, HISD defines this crisis, "The teacher crisis is a 'dramatic shortage' of teachers in critical fields such as mathematics, science... It is high teacher turnover in urban schools resulting in detrimental instability in urban classrooms. It is placing before our students, teachers who themselves cannot read, write, and compute in an acceptable manner. It is high absenteeism and low morale. It is a complex conglomeration

of factors which has resulted in widespread wavering from traditional standards of excellence."

The quality of teaching depends not only on teacher certification and preparation but on teacher morale, job satisfaction, and working conditions. The HISD Second Mile Plan is a study of these causal
G-6/7 factors and a means of compensation. There are actually six categories that qualify for incentive pay. They are: High Priority Location, Critical Staff Shortage, Professional Growth, Outstanding Education Progress, and Unique Campus Assignment. It is a staff stabilization plan -- KEEPING TEACHERS -- and maintaining qualified instruction.

Sixteen thousand school districts in the United States face a common problem: FINDING -- AND KEEPING -- GOOD MATHEMATICS AND SCIENCE TEACHERS. The shortage of qualified mathematics and science teachers has reached epidemic proportions at a time when mathematical and scientific literacy must be required of all students. In our increasingly technological society we need to attack the pervasive problems of status, salary, and schooling of the teachers of this nation.

Thousands of our students are graduating from high school without ever having had a single qualified teacher in one or more of the many courses contained in the disciplines of mathematics and science. The University of California reports that 92% of their entering freshmen lack sufficient mathematics to qualify for 3/4 of the possible majors. The time has come to make our schools stand for excellence again.

The National School Boards Association, the National Council of Teachers of Mathematics, and the Houston Independent School District together with other educational organizations have availed themselves of opportunities to testify before legislative committees in support of

a technologically literate citizenry as a national priority. As of the beginning of April, 1983, there were 13 separate Math-Science bills before the United States Senate. National leaders are urging the passage of bills that: (1) recognize the dignity and worth of school teachers; (2) address the improvement of mathematical and scientific literacy for the general population and the development of high level skills among the most talented; (3) build on state and local initiative and (4) support both good programs already in operation and new programs aimed at reform among others. Federal monies will soon be allocated for state and local use. Now is the time to plan for their prioritized distribution.

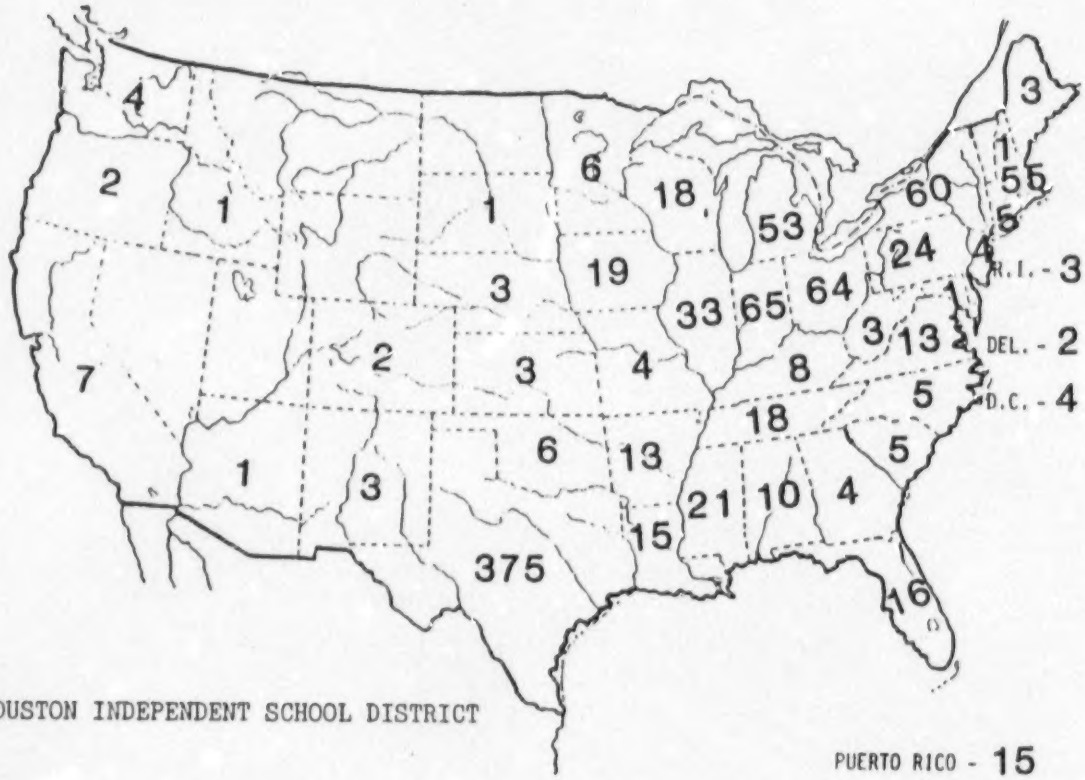
G-8 A framework for action is contained in the NCTM Agenda for Action, Recommendation 7: "School boards...should take all possible means to assure that mathematics programs are staffed by qualified, competent teachers who remain current in their fields." There are many dedicated and competent mathematics and science teachers in our public schools; recognize them. There are many teachers and would be teachers with mathematics and science backgrounds; recruit them. There are school programs and materials that have fallen below par; upgrade them. To support these actions, market adjusted salary schedules for qualified teachers of mathematics and science should be implemented now if we are to be successful in FINDING -- AND KEEPING -- GOOD MATH AND SCIENCE. TEACHERS.

TEACHER SUPPLY/DEMAND BY FIELD AND REGION

FIELD: MATHEMATICS

REGIONS		YEARS	
Northwest	4.42	1976	2.47
West	4.66	1978	3.86
Rocky Mt.	4.85	1979	4.40
Midwest	5.00	1980	4.68
South Central	4.71	1981	4.80
Southeast	5.00	1982	4.81
Great Lakes	4.83	1983	4.75
Middle Atlantic	4.83		
Northeast	4.50		

TEACHER RECRUITMENT BY STATE



HOUSTON INDEPENDENT SCHOOL DISTRICT

PUERTO RICO - 15

MAJOR SITES

College Campus
Professional Meeting
School District

TOTALS

978 Hired
1669 Interviewed
38% From Texas

1982-83 SECOND MILE PLAN COMPONENTS

Component		Estimated Payments (Budget)	Funding Source	Date of Scheduled Payment
Teachers (Function 11):				
High Priority Location:	B-1 Program #			
Elementary Teachers (FOAA-13 schools)	01	$ 730,000	General Fund	June 17, 1983
Elementary Teachers (50 schools)	N/A	2,600,000	Title I	June 17, 1983
Secondary Teachers	00	1,335,000	General Fund	June 17, 1983
Critical Staff Shortage	02	* 1,500,000	General Fund	June 17, 1983
Outstanding Teacher Attendance	04	1,500,000	General Fund	October 20, 1983
Professional Growth	03	325,000	General Fund	November 2, 1983
Outstanding Educational Progress	05	2,600,000	General Fund	December 16, 1983
Project Recruit	06	10,000	General Fund	December 16, 1983
Unique Campus	07	50,000	General Fund	June 17, 1983

TOTAL 82-83 Second Mile - General Fund $8,050,000

Title I $2,600,000

* Represents budgeted amount only. Actual payments are expected to be approximately $2.6 million, if the Board of Education approves a maximum stipend of $2,000.

Proposed changes in the Second Mile Plan include increasing the teacher shortage stipends to $2,000. A proficiency test is also being considered as an added baseline requirement.

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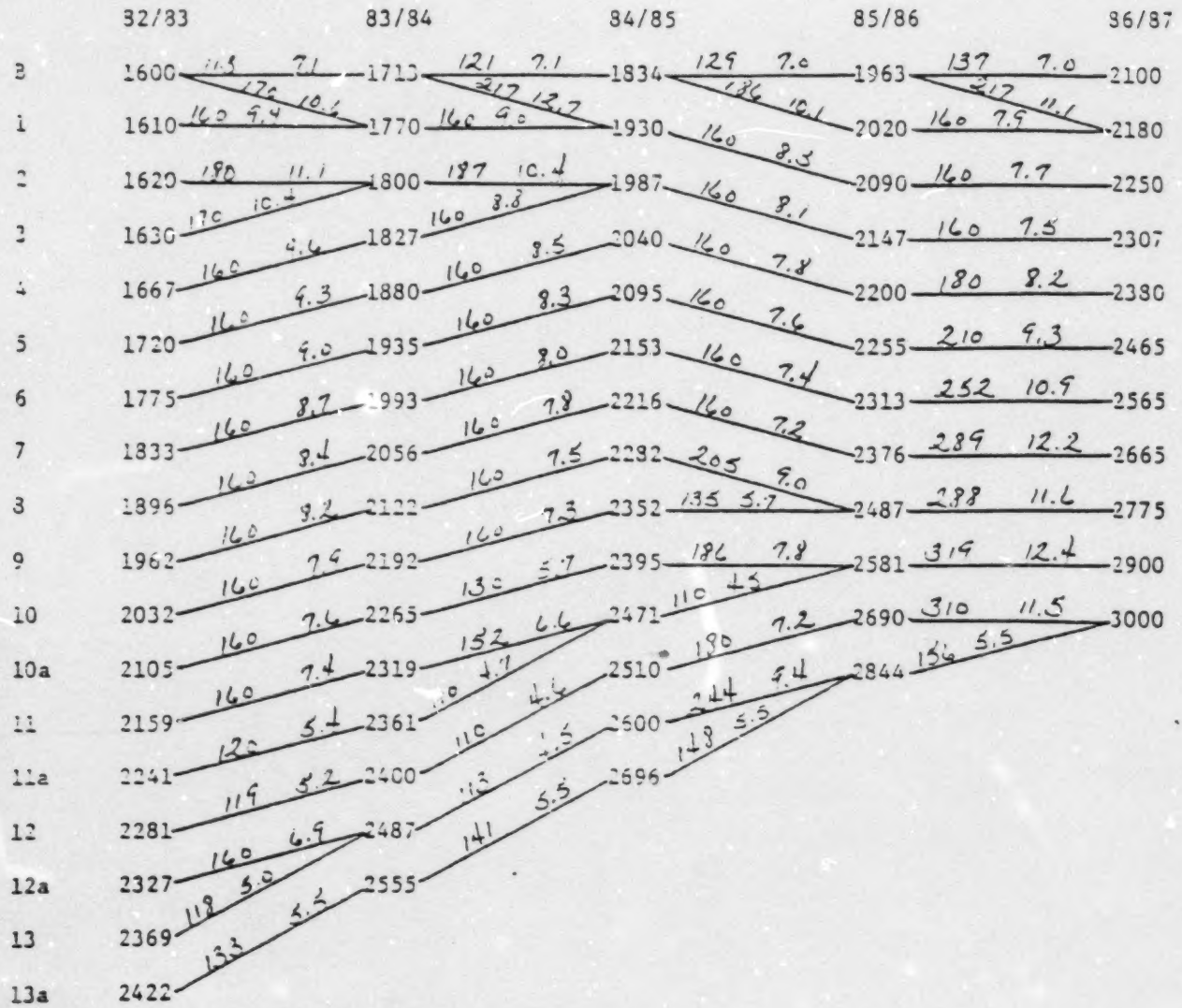
HOUSTON PLAN

HISD Pay Grade 7



ANNUAL LONGEVITY STIPENDS

Years	$	Years	$	Years	$	Years	$	Years	$
		14	400	13-14	300	12-14	250	11-14	200
13-19	400	15-19	500	15-19	500	15-19	500	15-19	500
20+	600	20+	700	20+	800	20+	1000	20+	1500

WHAT ARE THE SIX CATEGORIES THAT QUALIFY FOR INCENTIVE PAY?

- High Priority Location
- Critical Staff Shortage
- Professional Growth
- Outstanding Education Progress
- Unique Campus Assignment

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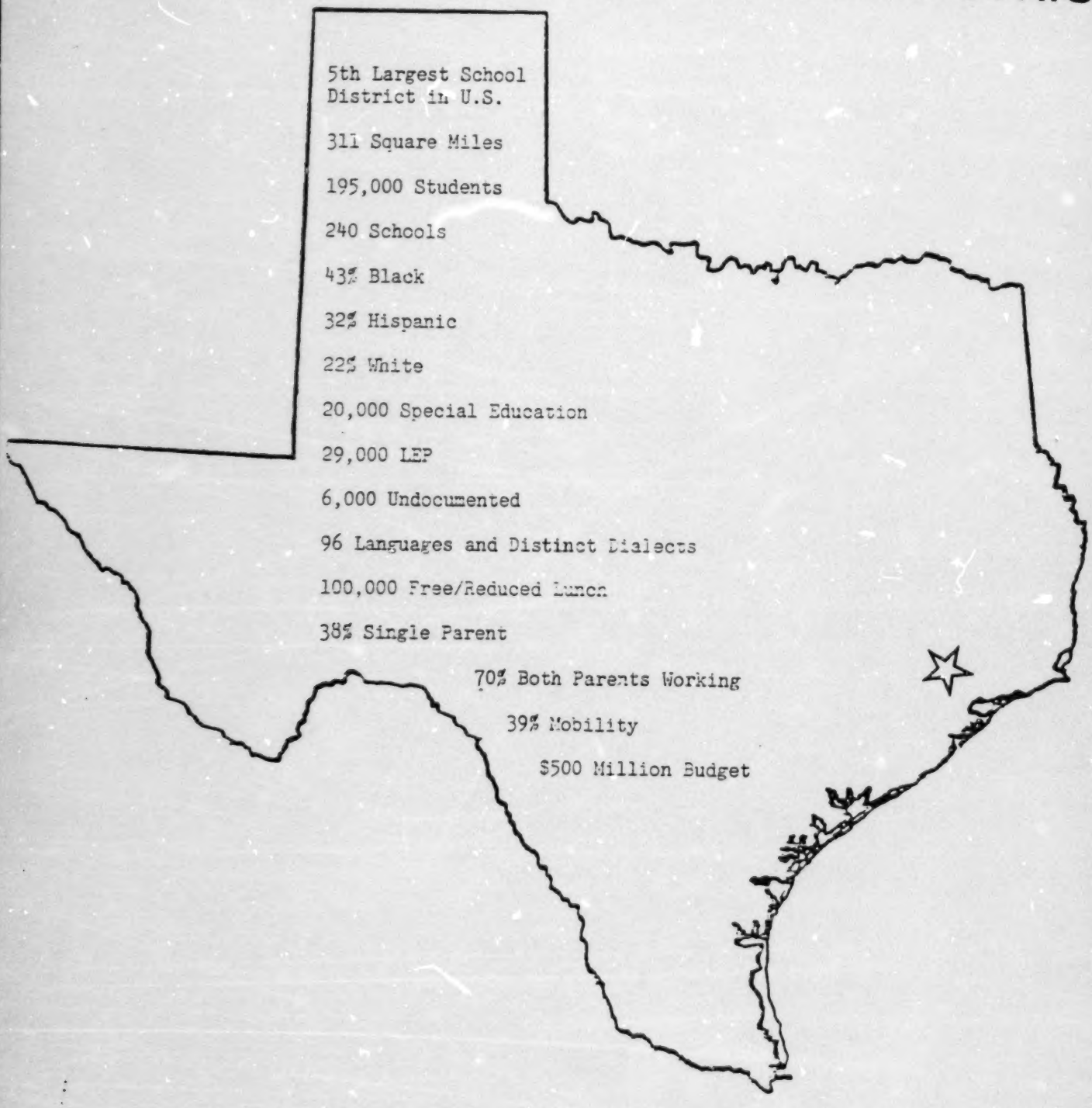
HOUSTON INDEPENDENT SCHOOL DISTRICT



WHAT IS THE PLAN?

- REWARD TEACHERS WHOSE STUDENTS EXHIBIT HIGH LEVELS OF ACADEMIC GROWTH;

- STABILIZE FACULTIES IN SCHOOLS WHERE TURNOVER HAS BEEN HIGH;

- ATTRACT TEACHERS IN AREAS WHERE CRITICAL SHORTAGES EXIST;

- IMPROVE TEACHER ATTENDANCE; AND

AN AGENDA FOR ACTION

RECOMMENDATION 7

7.2 School boards and school administrations should take all possible means to assure that mathematics programs are staffed by qualified, competent teachers who remain current in their field.

- Necessary incentives must be found to attract competent and dedicated teachers to the profession.
- The status, compensation, and teaching conditions necessary for the retention of qualified teachers must be dramatically improved.
- School districts must budget adequately and provide incentives for teachers to participate in in-service education pertinent to their immediate needs as they prepare to meet the challenge of the future.
- School district staffs, including teachers, must plan in-inservice education that is articulated with local colleges and universities as well as with professional organizations such as the NCTM and its state and local affiliates.
- School administrators should encourage teachers to take an active professional role and should permit them to participate, without penalty, in conferences and vital professional work.
- School systems should maintain well-qualified mathematics specialists or supervisors at all levels to help teachers achieve the professional level specified in these recommendations and to coordinate mathematics education efforts within the system.
- Well-qualified mathematics specialists should be on the staffs of all governmental agencies that deal with mathematics education — specifically, in all state and provincial departments of education, in the National Education Department, the National Institute of Education, and the National Science Foundation.

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